southern barometer was most depressed; while the reverse occurred with the southerly winds.

"On the Rectification and Quadrature of the Spherical Ellipse." By James Booth, Esq., M.A., Principal of Bristol College. Communicated by John T. Graves, of the Inner Temple, Esq., M.A., F.R.S.

The author, at the commencement of this paper, adverts to a rather complex discussion of a portion of the subject of his inquiry by M. Catalan, published in the *Journal de Mathématiques*, edited by M. Lionville.

He then proceeds to establish two fundamental theorems, applicable to,—1st, the quadrature, and 2nd, the rectification of the spherical ellipse.

1st. The quadrature of the spherical ellipse is reduced to the calculation of a complete elliptic function of the third order, whose parameter and modulus are quantities essentially related to the cone; its parameter being the square of the eccentricity of the ellipse, whose plane is at right angles to the axis of the cone, and its modulus being the sine of the semi-angle between the focals.

2nd. The rectification of the spherical ellipse is made to depend on a complete elliptic function of the third order, whose parameter is the same as in the preceding case, but whose modulus is the sine of the angle between the planes of the elliptic base and of one of the circular sections.

The author then proceeds to establish a remarkable relation between the area of a given spherical ellipse and the length of the spherical ellipse generated by the intersection of the supplemental cone with the same sphere.

He shows that if there are two concentric supplemental cones cut by the surface of a concentric sphere,—1st, the *sum* of their spherical bases, together with twice their lateral surfaces, is equal to the surface of the sphere; 2nd, the *difference* of their spherical bases is equal to twice the difference of their lateral surfaces.

Hence, also, he deduces a remarkable theorem, viz. the sum of the spherical bases of any cone whose principal angles are supplemental, cut by a sphere, together with twice the lateral surface of the cone comprised within the sphere, is equal to the surface of the sphere.

The author then, alluding to some researches of Professor MacCullagh and of the Rev. Charles Graves, Fellow of Trinity College, Dublin, proceeds to give a simple elementary proof of a well-known formula of rectification, and thence deduces some remarkable properties of the tangent at that point of the ellipse, which is termed by him the point of *rational section*.

Assuming the properties of the plane ellipse, he proceeds to show that a similar formula of rectification holds for any curve generated by the intersection of a spherical surface with a concentric cone of any order. He goes on to develope a series of properties of the spherical ellipse, bearing a striking analogy, as indeed might have been expected, to those of the plane curve. Thus he establishes a

point of *rational section* as in the plane ellipse, shows that the tangent arc is at this point a *minimum*, and developes some other curious analogies. It is a simple consequence of his formula that the spherical elliptic quadrant may be divided into two arcs whose difference shall be represented by an arc of a great circle. This theorem, previously obtained by M. Catalan, is analogous to that of Fagnani, which shows that the difference of two plane elliptic arcs may be represented by a straight line.

The author concludes by reducing the quadrature of the surface of a cone of the second degree, bounded by a plane perpendicular to the axis, to the determination of a complete elliptic function of the second order.

The Society then adjourned over the Whitsun Recess, to meet again on the 26th instant.